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ORIGINAL ARTICLE

# Medical Educationduring COVID-19: Association between e-Learning Practice and Mental Health Status of Medical Students in Universiti Kebangsaan Malaysia

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## *ABSTRAK*

*Kemuncak pandemik penyakit Coronavirus 2019 (COVID-19) memaksa Fakulti Perubatan Universiti Kebangsaan Malaysia (UKM) untuk memastikan peralihan daripada pembelajaran bersemuka kepada pengajaran dalam talian untuk kesinambungan pendidikan. Kajian ini bertujuan untuk mengkaji perkaitan antara e-pembelajaran dengan status kesihatan mental pelajar perubatan UKM. Kajian keratan rentas telah dijalankan dalam kalangan pelajar perubatan Tahun 4 dan 5 UKM. Peserta dipilih secara rawak daripada senarai berdaftar. Persepsi pelajar terhadap penggunaan e-pembelajaran sebelum dan semasa wabak COVID-19 dan kaitannya dengan status kesihatan mental telah dinilai menggunakan soal selidik Kualiti Hidup Pertubuhan Kesihatan Sedunia (WHOQOL-BREF) dan "Hospital Anxiety and Depression Scale" (HADS). Skor min untuk kemurungan ialah 5.35 (SD 3.38) dan kebimbangan ialah 6.48 (SD 3.36). Kekerapan penggunaan e-pembelajaran setiap minggu telah meningkat semasa COVID-19 berbanding tempoh sebelum COVID (p=0.045). Perbandingan empat domain kualiti hidup (QOL), kesihatan psikologi mempunyai skor min terendah iaitu 62.63 (SD 15.22)*

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*manakala domain persekitaran adalah yang tertinggi 69.34 (SD 10.92). Jumlah skor QOL berkorelasi dengan ketara dengan kemurungan (p<0.001) dan kebimbangan (p<0.001). Kajian ini memberikan pandangan tentang kesan amalan e-pembelajaran terhadap status kesihatan mental pelajar perubatan. Peningkatan ketara dalam penggunaan e-pembelajaran semasa COVID-19 telah diperhatikan.*

*Kata kunci: COVID-19; e-pembelajaran; kesihatan mental; kualiti hidup; pelajar perubatan*

## ABSTRACT

The emergence of Coronavirus disease 2019 (COVID-19) pandemic forced the Faculty of Medicine, Universiti Kebangsaan Malaysia (UKM) to ensure the transition from face-to-face learning to online teaching for continuity of education. This study aimed to investigate the association between e-learning and mental health status of UKM medical students. A cross-sectional study was carried out among Years 4 and 5 UKM medical students. Participants were randomly selected from a registered list. Students' perceptions of e-learning usage prior to and during COVID-19 pandemic and its relation to mental health status were assessed using The World Health Organisation Quality of Life (WHOQOL-BREF) and Hospital Anxiety and Depression Scale (HADS) questionnaires. Mean scores for depression were 5.35 (SD 3.38) and anxiety 6.48 (SD 3.36). The frequency of e-learning usage per week was increased during COVID-19 compared to pre-COVID period (p=0.045). Comparing the four domains of quality od life (QOL), psychological health had the lowest mean score of 62.63 (SD 15.22) while the environmental domain was the highest 69.34 (SD 10.92). Total QOL scores were significantly correlated with depression (p<0.001) and anxiety (p<0.001). This study provided insights into the effect of e-learning practice on medical students' mental health status. A significant increase in e-learning usage during COVID-19 was observed.

Keywords: COVID-19; e-learning; medical students; mental health; quality of life

## INTRODUCTION

The emergence of Coronavirus disease 2019, also known as COVID-19, has taken the world by storm, causing a global pandemic with severe effects on all nations, including Malaysia (Moy & Ng 2021). COVID-19 has an exponential infectious property that can spread quickly in a population. Therefore, the government implemented the movement control order (MCO) to reduce social contact among people as a protective measure against COVID-19 (Moy & Ng 2021). During periods of social distancing at all class levels, including medical education, e-learning has facilitated

the access to education (Pelucio et al. 2022).

E-learning is a familiar concept in medical education. However, during the COVID-19 era, educators and students were strained to explore the possibilities and opportunities in e-learning to attain quality education (Pelucio et al. 2022). The abrupt shift from traditional face-to-face learning to e-learning caused considerable challenges among medical educators and students (Lee et al. 2020). Compared with pre-pandemic times, university students underwent greater stress and anxiety during the COVID-19 era and one of the identified stressors that caused their anxiety is remote online learning (Moy & Ng 2021).

In 1947, the World Health Organisation (WHO) defined quality of life (QOL) as a 'state of complete physical, mental and social well-being, and not merely the absence of disease and infirmity' (Post 2014). Most methodology practitioners have begun incorporating at least three QOL domains, namely, physical function, mental status and ability to engage in normative social interactions (Post 2014). As for mental health, it is defined as not solely the absence of disease or disorder but entails self-esteem, mastery, and the ability to maintain meaningful relationships with others (Scheid & Brown 2012). Patients who have been referred to mental health facilities have a level of QOL that is highly associated with the gravity of their mental health issues (Sharpe et al. 2016). Mental health and QOL are strongly related even though both are distinct from each other (Sharpe et al. 2016).

In this study, we investigated the associations between QOL and e-learning by using the WHOQOL-BREF and between mental health status and e-learning by using the HADS on Years 4 and 5 medical students of the Universiti Kebangsaan Malaysia (UKM). Both questionnaires had been previously validated.

## MATERIALS AND METHODS

This study was granted approval by Research Ethics Committee of UKM (UKM PPI/111/8/JEP-2022-249). All participants were provided written informed consent.

### Study Design and Participants

A cross-sectional observational study was carried out from October 2021 to October 2022 using structured self-administered questionnaires. The estimated sample size was calculated on the basis of prevalence from the research of Villanueva et al. (2021) and the target was 140 respondents. The inclusion criteria were medical students in Years 4 and 5 at the UKM medical school, whereas the exclusion criteria were all participants who failed to complete answering all of the questionnaire items. A total of 143 UKM medical students were randomly recruited from the list of student registration. A total of 84 respondents from Year 4 and 59 respondents from Year 5 participated in this study. Participation was voluntary and all data were kept confidential.

## Data Collection and Study Tool

The survey was distributed online via Google Forms. Two validated questionnaires, WHOQOL-BREF and HADS, were used as research tools and outcome measures. The WHOQOL-BREF questionnaire consisted of five sections and served as a brief alternative to the WHOQOL-100. Section 1 included socio-demographic descriptive information (gender, ethnicity, year of study, personality trait, hobby, reason for choosing medical profession, ownership of electronic device and rate of Internet connectivity). Section 2 addressed the respondents' experience with e-learning usage before and during COVID-19 (online learning platform used prior to COVID-19, duration and frequency spent on online learning before and during COVID-19, preferred e-learning tools during COVID-19 and preference of learning method during COVID-19).

The choices given for online learning platform used prior to COVID-19 include Zoom, Microsoft Teams, Google Meet, UKMfolio and Webinar. During the pandemic, the choices included e-book, online research article, online medical education site, Kahoot, Questionbank and video. Section 3 evaluated the student perceptions of and feedback on e-learning. Section 4 described how e-learning affected the QOL of medical students. A total of 26 questions were included regarding the participants' perceptions of their health and well-being compared with 100 questions from WHOQOL (WHO 2012). Domain scores for WHOQOL-BREF were calculated using each domain's mean of items multiplied by a factor of four (WHO 2012). The obtained scores were then transformed into a 0–100 scale (WHO 2012). Section 5 described how e-learning affected the mental health of medical students using the HADS questionnaire, a self-report survey that used 14 items to measure two subscales: anxiety and depression (Michopoulos et al. 2008). Each item was rated on a four-point scale, yielding a maximum score of 21 (Michopoulos et al. 2008). By summing the score of both subscales, the total score was interpreted as normal (0-7), borderline abnormal (8-10) and abnormal (11-21) (Zigmond & Snaith 1983).

## Statistical Analysis

All results were analysed using Statistical Package for Social Sciences (SPSS) Version 22. Demographic characteristics, QOL score, and mental health status score (HADS) were presented with their means, standard deviation (SD) and percentages. Bar graph was used to demonstrate relevant study factors. P-value less than 0.05 was considered statistically significant. The association between e-learning and QOL score was evaluated using the one-way ANOVA test due to criteria met with the observed variables, which ensured assumptions such as minimum expected count before the analysis. Finally, a multiple linear regression analysis was carried out to unveil the predictors of the dependent variables of depression and anxiety scores.

## RESULTS

This study surveyed 143 respondents, among whom 94 (65.7%) were female and 49 (34.3%) were male. In terms of ethnicity, the participants included 58 Malay (40.6%), 36 Chinese (25.2%), 36 Indian (25.2%) and a few other groups such as Bumiputera Sabah and Sarawak. In addition, 84 (58.7%) participants were from Year 4 and 59 (41.3%) were from Year 5. The respondents were further categorised into two major personality types, namely, A and B. Most were Type B personalities, with approximately 105 (73.4%) of the respondents. Hobbies were also determined and classified as indoor and outdoor activities. Respondents were asked to list their hobbies and given the liberty to state more than one. Most of the participants 83 had indoor hobbies, while 33 had outdoor hobbies. Three respondents mentioned that they did not have any hobbies. Reasons for choosing the medical profession were divided into four categories: personal interest, parent's influence, job security and uncertain. Most of the respondents (69.2%) chose the medical profession on the basis of personal interests. The options for the ownership of electronic devices were smartphones, laptops, and tablets, and the respondents were allowed to choose more than one option. Only one respondent (0.7%) had one device whereas 99 respondents (69.2%) had all three gadget types. The rate of Internet connectivity was categorised as very poor, poor, moderate, good and very good. More than half of the respondents (53.1%) stated that their Internet connectivity rate was good. Table 1 summarised the demographic background of the study participants.

### Analysis of e-Learning and Medical Education

Most of the medical students (86.7%) had used e-learning platforms prior to the COVID-19 pandemic and were then further asked to choose or list these options. Results showed that most of the students (n=127) used UKMFolio prior to COVID-19 (Figure 1).

Table 2 showed the frequency of e-learning per week before and during COVID-19, as divided into three usage levels: low (less than 5 times), moderate (5-10 times) and high (more than 10 times). Before COVID-19, most of the respondents (76.2%) selected low usage and only a few (4.2%) had chosen high usage. Conversely, during COVID-19, most respondents (53.8%) selected high usage of e-learning, given the full transition from face-to-face medical education. Therefore, the number of respondents with high e-learning usage frequency considerably increased during the pandemic (53.8%) compared with the pre-COVID era (4.2%). This comparison of frequency of e-learning usage was evaluated using the Fisher Exact test, showing a significant difference ($p=0.045$) due to the rise in high usage of e-learning during the COVID-19 era.

In terms of online learning platforms, respondents were given the liberty to choose more than one provided

TABLE 1: Demographic background of participants

| Variables | Female (%) n = 94 | Male (%) n = 49 | Total (%) N = 143 |
|---|---|---|---|
| Ethnicity | | | |
| Malay | 36 (38.3) | 22 (44.9) | 58 (40.6) |
| Chinese | 24 (25.5) | 12 (24.5) | 36 (25.2) |
| Indian | 24 (25.5) | 12 (24.5) | 36 (25.2) |
| Others | 10 (10.6) | 3 (6.1) | 13 (9.1) |
| Year of Study | | | |
| Year 4 | 59 (62.8) | 25 (51.0) | 84 (58.7) |
| Year 5 | 35 (37.2) | 24 (49.0) | 59 (41.3) |
| Personality | | | |
| Type A | 22 (23.4) | 16 (32.7) | 38 (26.6) |
| Type B | 72 (76.6) | 33 (67.3) | 105 (73.4) |
| Reason for choosing medical profession | | | |
| Personal interest | 65 (69.1) | 34 (69.4) | 99 (69.2) |
| Parent's influence | 9 (9.6) | 4 (8.2) | 13 (9.1) |
| Job security | 5 (5.3) | 4 (8.2) | 9 (6.3) |
| Uncertain | 15 (16.0) | 7 (14.3) | 22 (15.4) |
| Ownership of electronic devices | | | |
| 1 device (smartphone) | 1 (1.1) | 0 (0) | 1 (0.7) |
| 2 devices (smartphone and laptop; smartphone and tablet) | 27 (28.7) | 16 (32.7) | 43 (30.1) |
| 3 devices (smartphone, laptop and tablet) | 66 (70.2) | 33 (67.3) | 99 (69.2) |
| Rate of internet connectivity | | | |
| Very poor | 0 (0) | 0 (0) | 0 (0) |
| Poor | 0 (0) | 0 (0) | 0 (0) |
| Moderate | 19 (20.2) | 8 (16.3) | 27 (18.9) |
| Good | 52 (55.3) | 24 (49.0) | 76 (53.1) |
| Very good | 23 (24.5) | 17 (34.7) | 40 (28.0) |

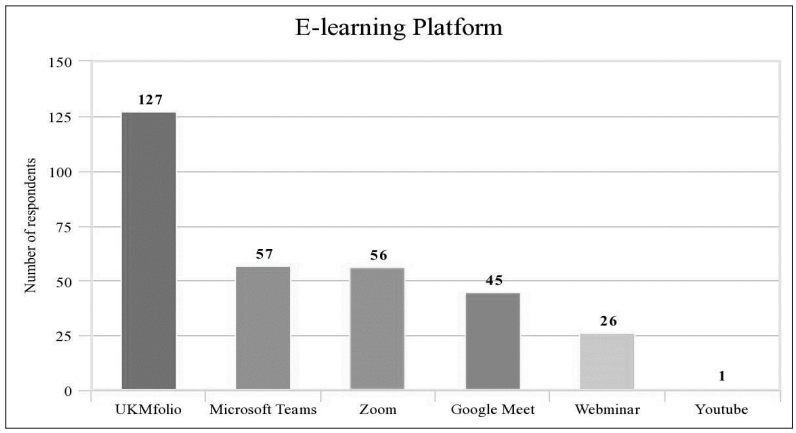


FIGURE 1: e-learning platforms used prior to COVID-19

TABLE 2: E-learning usage frequency before and during COVID-19

| Variables | Timeframe | |
|---|---|---|
| | Pre-COVID-19 | During COVID-19 |
| Low (Less than 5 times) (%) | 109 (76.2%) | 14 (9.8%) |
| Moderate (5 to 10 times) (%) | 28 (19.6%) | 52 (36.4%) |
| High (More than 10 times) (%) | 6 (4.2%) | 77 (53.8%) |
| Value for Fisher's exact test | 9.024 | |
| p-value | 0.045 | |

option: e-book, online research article, online medical education site, Kahoot, question bank and informative educational videos. Most of the respondents (n=128) selected e-books as their preferred online learning tool (Figure 2). Both lecturers and students relied on a physical teaching during pre-COVID era. UKMfolio was launched only on 18 February 2020, therefore there was no data available on the usage of UKMfolio before MCO.

The preferred learning method during COVID-19 was categorised as blended or full e-learning. Most of the respondents (90.2%) selected blended learning as their preference during COVID-19. Only 9.8% of the respondents selected full e-learning.

## Analysis on the Feedback and Challenges of e-Learning

The feedback on the perception towards e-learning was scored as 1 to 5, with high scores indicated high agreement with the statement (Table 3). The students highly agreed that e-learning technology was easy to use (1.59 $\pm$ 0.87) but disagreed regarding its effectiveness compared with traditional face-to-face teaching (2.34 $\pm$ 1.16).

The students also stated which aspects of e-learning they liked, scored as 1 to 5, with high scores showing their preference (Table 3). The highest score was given to comfortable surroundings (4.20 $\pm$ 1.13), followed by the option to record and replay (3.90 $\pm$ 1.21) and learning at their own pace (3.57 $\pm$ 0.63).

For the challenges of online learning, students were allowed to choose more than one answer from the provided

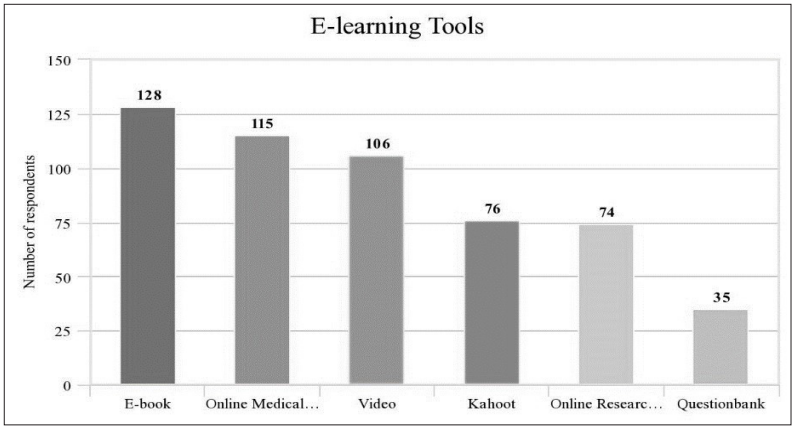


FIGURE 2: Preferred e-learning tools during COVID-19

TABLE 3: Frequencies and percentages of feedback, advantages and challenges of e-learning

| **Feedback on e-Learning** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Statements** | **Mean** | **SD** | **Score (n, %)** | | | | |
| | | | **1 (most disagree)** | **2** | **3** | **4** | **5 (most agree)** |
| E-learning technology is easy used | 1.59 | 0.87 | 0 (0%) | 0 (0%) | 11 (7.7%) | 95 (66.4%) | 37 (25.9%) |
| Easy to engage in E-learning session | 1.95 | 1.18 | 0 (0%) | 15 (10.5%) | 26 (18.2%) | 79 (55.2%) | 23 (16.1%) |
| E-learning promotes creativity and teamwork | 2.14 | 1.15 | 2 (1.4%) | 23 (16.1%) | 39 (27.3%) | 61 (42.7%) | 18 (12.6%) |
| E-learning is as effective as traditional face-to-face teaching | 2.34 | 1.16 | 10 (7.0%) | 45 (31.5%) | 38 (26.6%) | 40 (28.0%) | 10 (7.0%) |
| Difficult to adapt E-learning schedule during COVID-19 | 2.29 | 1.05 | 5 (3.5%) | 44 (30.8%) | 45 (31.5%) | 39 (27.3%) | 10 (7.0%) |
| E-learning reduces the understanding of knowledge | 2.24 | 0.99 | 4 (2.8%) | 51 (35.7%) | 43 (30.1%) | 8 (5.6%) | 8 (5.6%) |
| **Advantages of e-Learning** | | | | | | | |
| **Statements** | **Mean** | **SD** | **Score (n, %)** | | | | |
| | | | **1 (most dislike)** | **2** | **3** | **4** | **5 (most like)** |
| Option to record and replay | 3.90 | 1.21 | 2 (1.4%) | 5 (3.5%) | 10 (7.0%) | 53 (37.1%) | 73 (51%) |
| Learn at your own pace | 3.57 | 0.63 | 0 (0%) | 1 (0.7%) | 8 (5.6%) | 43 (30.1%) | 91 (63.6%) |
| Comfortable surroundings | 4.20 | 1.13 | 1 (0.7%) | 1 (0.7%) | 12 (8.4%) | 37 (25.9%) | 92 (64.3%) |
| **Challenges of e-Learning** | | | | | | | |
| **Statements** | | | **Frequency (n)** | | **Percentage (%)** | | |
| Easily distracted | | | 3 | | 2.1 | | |
| Easily distracted, Duration of class beyond schedule | | | 10 | | 7.0 | | |
| Financial issues, Duration of class beyond schedule | | | 1 | | 0.7 | | |
| Internet connection | | | 4 | | 2.8 | | |
| Internet connection, Duration of class beyond schedule | | | 10 | | 7.0 | | |
| Internet connection, Easily distracted | | | 21 | | 14.7 | | |
| Internet connection, Easily distracted, Duration of class beyond schedule | | | 67 | | 46.9 | | |
| Internet connection, Financial issue, Duration of class beyond schedule | | | 2 | | 1.4 | | |
| Internet connection, Financial issue, Easily distracted | | | 4 | | 2.8 | | |
| Internet connection, Financial issue, Easily distracted, Duration of class beyond schedule | | | 21 | | 14.7 | | |

options, which included problems such as Internet connection, financial issues, distractions during online teachings and duration of classes that exceeded the intended schedule. A majority of 67 (46.9%) respondents selected Internet connection, being easily distracted and duration of class beyond schedule as the challenges they faced (Table 3).

## Analysis of QOL of Medical Students during COVID-19

Comparing the four domains, psychological health had the lowest mean score of (62.63 ± 15.22) while the environmental domain was the highest (69.34 ± 10.92) (Table 4).

## Analysis on the Association between e-Learning and QOL of Medical Students

One-way ANOVA test was used to investigate whether the different rates of Internet connectivity affected QOL domains. The rates of internet connectivity were divided into moderate, good and very good. Levine's test was used to verify the equality of variances in the samples (homogeneity of variance; $p>.05$). Rates of Internet connectivity had a significant effect on the physical ($F$ (2, 140) =3.98, $p<0.05$), psychological ($F$ (2, 140) =5.77, $p<0.05$) and environment ($F$ (2, 140) =7.43, $p<0.05$) domains (Table 5). Participants who rated their Internet connectivity as 'very good' had high scores of QOL in every domain while those who used 'moderate' ratings had low QOL scores in every domain.

TABLE 4: Mean scores of results for each domain obtained via WHOQOL-BREF

| Domain | Mean Score | SD |
|---|---|---|
| Physical | 66.93 (High) | 13.97 |
| Psychological | 62.63 (Moderate) | 15.22 |
| Social Relationships | 64.97 (Moderate) | 15.99 |
| Environment | 69.34 (High) | 10.92 |

One-way ANOVA test was also used to investigate whether the different usages of e-learning during COVID-19 affected QOL domains. The usage of e-learning during COVID-19 was divided into low (less than 5 times), moderate (5 to 10 times) and high (more than 10 times). A Levine's test verified the equality of variances in the samples (homogeneity of variance) ($p>.05$). The usage of e-learning during COVID-19 had a significant effect on the social domain ($F$ (2, 140) =3.35, $p<0.05$) (Table 5).

One-Way ANOVA was also used to study whether students' perception towards e-Learning affected their QOL. A Levine's test verified the equality of variances in the samples (homogeneity of variance) ($p>.05$). Students' perceptions that technology is easy to use had a significant effect on psychological ($F$ (2, 140) =5.47, $p<0.05$) and environmental domains ($F$ (2, 140) =7.14, $p<0.05$). Similarly, their perceptions that e-Learning is easy to engage in were also significant for the same two domains, ($F$ (2, 140) =3.39, $p<0.05$) and ($F$ (2, 140) = 3.73, $p<0.05$), respectively. The perception that e-Learning promotes creativity and teamwork significantly affected the psychological domain ($F$ (2, 140) =3.46, $p<0.05$). Meanwhile, only social

TABLE 5: One-way ANOVA results between rates of Internet connectivity and QOL of medical students

| Rate of connectivity and QOL | | | | | | |
|---|---|---|---|---|---|---|
| **Domain** | | **Mean** | **SD** | **df** | **F** | **Sig** |
| Physical | Moderate | 61.38 | 13.94 | 2 | 3.98 | .02 |
| | Good | 66.78 | 13.76 | | | |
| | Very Good | 70.98 | 13.37 | | | |
| | Total | 66.93 | 13.97 | 140 | | |
| Psychological | Moderate | 55.93 | 16.22 | 2 | 5.77 | .00 |
| | Good | 62.06 | 13.92 | | | |
| | Very Good | 68.25 | 15.19 | | | |
| | Total | 62.63 | 15.22 | 140 | | |
| Social | Moderate | 61.73 | 17.94 | 2 | .72 | .49 |
| | Good | 65.46 | 13.79 | | | |
| | Very Good | 66.25 | 18.46 | | | |
| | Total | 64.98 | 15.99 | 140 | | |
| Environment | Moderate | 64.12 | 8.55 | 2 | 7.43 | <.00 |
| | Good | 68.75 | 10.50 | | | |
| | Very Good | 73,98 | 11.48 | | | |
| | Total | 69.34 | 10.92 | 140 | | |

| Usage of E-Learning and QOL | | | |
|---|---|---|---|
| **Domain** | **df** | **F** | **Sig** |
| Physical | 2 | .49 | .61 |
| | 140 | | |
| Psychological | 2 | .49 | .62 |
| | 140 | | |
| Social | 2 | 3.35 | .04 |
| | 140 | | |
| Environment | 2 | .50 | .61 |
| | 140 | | |

| Perception of E-Learning and QOL | | | | |
|---|---|---|---|---|
| **Perception** | **Domain** | **df** | **F** | **Sig** |
| Technology is easy to use | Physical | 2 | 2.43 | .09 |
| | | 140 | | |
| | Psychological | 2 | 5.47 | .01 |
| | | 140 | | |
| | Social | 2 | 1.15 | .32 |
| | | 140 | | |
| | Environment | 2 | 7.14 | .00 |
| | | 140 | | |
| Easy to engage | Physical | 2 | .69 | .56 |
| | | 140 | | |
| | Psychological | 2 | 3.39 | .02 |
| | | 140 | | |
| | Social | 2 | 1.96 | .12 |
| | | 140 | | |
| | Environment | 2 | 3.73 | .01 |
| | | 140 | | |

| | | | | |
|---|---|---|---|---|
| Promotes creativity & teamwork | Physical | 2<br>140 | 1.41 | .23 |
| | Psychological | 2<br>140 | 3.46 | .01 |
| | Social | 2<br>140 | 1.96 | .10 |
| | Environment | 2<br>140 | 1.31 | .27 |
| Reduces understanding of knowledge | Physical | 2<br>140 | 2.47 | .05 |
| | Psychological | 2<br>140 | 1.03 | .39 |
| | Social | 2<br>140 | 2.52 | .04 |
| | Environment | 2<br>140 | 1.04 | .39 |
| As effective as face-to-face teaching | Physical | 2<br>140 | 1.59 | .18 |
| | Psychological | 2<br>140 | 1.88 | .12 |
| | Social | 2<br>140 | 1.45 | .22 |
| | Environment | 2<br>140 | 1.39 | .24 |
| Difficult to adapt | Physical | 2<br>140 | .24 | .91 |
| | Psychological | 2<br>140 | .92 | .46 |
| | Social | 2<br>140 | 1.08 | .37 |
| | Environment | 2<br>140 | .26 | .90 |

domain was significantly affected by the perception that e-Learning reduces the understanding of knowledge ($F$ (2, 140) =2.52, $p$<0.05). No significant associations were observed between the perception that e-Learning is as effective as face-to-face teaching and is difficult to adapt.

Pearson correlation test was carried out between challenges of online learning and QOL domains. Pearson product correlation of the challenges of online learning and environmental domain of QOL was found to be negative and statistically significant ($r$= 201, $p$<0.05). This result showed that an increase in the challenges of online learning can lead to a decrease in environmental QOL.

## Analysis on Mental Health Status of Medical Students during COVID-19

The overall mean score for each HADS sub-scale was 5.35 (SD 3.38) for depression and 6.48 (SD 3.36) for anxiety. The percentages of borderline abnormal and abnormal depression cases were 16.8% and 8.4%, respectively whilst those of borderline abnormal and abnormal anxiety cases were 23.8% and 11.2%, respectively (Table 6).

TABLE 6: Descriptive analysis of respondents with normal, borderline abnormal and abnormal depression and anxiety

| Variables | Depression | | | Anxiety | | |
|---|---|---|---|---|---|---|
| | Normal | Borderline abnormal | Abnormal | Normal | Borderline abnormal | Abnormal |
| Frequency (%) | 107 (74.8) | 24 (16.8) | 12 (8.4) | 93 (65.0) | 34 (23.8) | 16 (11.2) |
| Mean | | 5.35 | | | 6.48 | |
| SD | | 3.38 | | | 3.36 | |

## Analysis on the Association between QOL and HADS Score

Multiple linear regression analysis was carried out to unveil the predictors of the dependent variables, depression and anxiety. The overall regression score for depression was statistically significant (R =.619, F (4, 138) =21.415, $p$<.001). The overall regression for anxiety score was statistically significant (R =.432, F (4, 138) =7.905, $p$<.001).

Table 7 showed the unique individual contributions of each predictor. The results revealed that physical and psychological domains had significant and negative effects on depression scores (B = - .092, $p$ < .001) and (B = - .104, $p$ < .001) respectively. Meanwhile, the physical domain had a significant and negative impact on anxiety score (B = - .36, $p$ = .002). The findings showed that social and environmental domain did not significantly predict depression ($p$>.05) whilst psychological, social and environment domains did not significantly predict anxiety ($p$ > .05).

## DISCUSSION

The COVID-19 pandemic has caused a transition from traditional face-to-face education to e-learning. The Faculty of Medicine, UKM, has adapted the online education method due to restricted student movement in campus. In this study, we examined QOL as one of the components of mental health status among medical students. Among the four domains in QOL, the psychological domain had the lowest mean score (62.63), followed by social

TABLE 7: Regression models of factors related to depression and anxiety

| Dependent Variables | Predictors | Beta | t | Sig |
|---|---|---|---|---|
| Depression scores | Physical domain | -0.092 | -4.385 | **<.001** |
| | Psychological domain | -0.104 | -4.930 | **<.001** |
| Anxiety score | Physical domain | -0.363 | -3.088 | **.002** |
| | Psychological domain | -0.146 | -1.138 | .257 |
| | Social domain | 0.048 | 0.475 | .636 |
| | Environmental domain | 0.040 | 0.382 | .703 |

(64.97). The possible reason is the implementation of social distancing and restrictive measures to control the spread of COVID-19. Compared with a previous study among university students in medicine faculties in Malaysia, the current mean scores were relatively low for each domain, including physical (66.93 vs 75.31), psychological (62.63 vs 67.72), social (64.97 vs 68.32) and environmental (69.34 vs 74.61) (Abdullah et al. 2020). The stressful medical school environment was one of the factors leading to the deterioration of mental health and poor psychological well-being among students (Abdullah et al. 2020).

The present study showed similar results to those of research in China that explored the mental health status and associated risk factors among medical students who engaged in online learning during COVID-19 (Chang et al. 2021). A high level of depression and anxiety was found among Chinese medical students, with 31.9% and 32.9% exhibiting mild to severe depressive and anxiety symptoms, respectively, similar to the findings of our study (Chang et al. 2021). During the MCO in Malaysia, the prevalence of depression and anxiety among university students were 29.4% and 51.3%, respectively, which was much higher than our results (Moy & Ng 2021). The difference in mental health status may be due to the survey being carried out in the early phase of the COVID-19 pandemic among undergraduate and postgraduate students from various fields (Moy & Ng 2021).

The participants in this study showed a notable increase of high usage of e-learning during the pandemic compared with pre-COVID, with 53.8% and 4.2%, respectively. In India, various patterns of increased Internet usage since the COVID-19 outbreak had both positive and negative influences (Jovic et al. 2020). Rates of internet connectivity had significant effects on the physical, psychological and environmental aspects of QOL (Table 5). Participants who rated their Internet connectivity as 'very good' had high scores of QOL in every domain while those who rated theirs as 'moderate' had low QOL scores in every domain (Table 5). In addition, participants' perceptions of e-learning affected their QOL. The perceptions of e-learning as 'technology is easy to use', 'easy to engage in' and 'promotes creativity and teamwork' significantly affected the psychological domain of QOL. Social QOL was significantly affected by the perception that e-learning reduces the understanding of knowledge while environmental QOL was affected by perceptions of e-learning as 'technology is easy to use' and 'easy to engage in' (Table 5).

In the multivariate analysis, medical students with low scores in the physical and psychological domains had high depression scores. However, no significant dependence was observed regarding to the social and environmental domains of QOL. By contrast, Park et al. (2015) indicated that medical students in Korea with no social support had a higher prevalence of depression than those who can receive help from family and friends.

Medical students with a low score in the physical domain had a high anxiety score. The fear of contracting COVID-19 and a hectic schedule can increase the anxiety levels of medical students. Anxiety and depression were found to be associated with a poor QOL score, as proven by a study at the University of Malaya before COVID-19 (Gan & Yuen Ling 2019).

One of the identified limitations of this study was the uneven distribution of Years 4 and 5 students, the majority of whom were from Year 4. Therefore, the assessment of Year 5 students' perceptions towards e-learning, QOL and mental health during COVID-19 may not be representative. These students showed a lack of cooperation in responding to the questionnaire, which may be due to the elements explored in this questionnaire might be time consuming for respondents to read and respond. Furthermore, this study only included students from one medical institution, which was therefore another limitation.

## CONCLUSION

The analysis of the QOL of medical students during COVID-19 showed that among the domains, psychological health had the lowest mean score (M=62.63) while environmental had the highest mean score (M=69.34). The mental health status of medical students using HADS showed that medical students with anxiety and depression were significantly associated with poor QOL. Therefore, this study showed a significant and negative relation between e-learning and the mental health status of medical students during the COVID-19 pandemic. Further investigations on modifications and adaptations of e-learning can help the faculty administration in planning effective programs and catering to students' mental well-being in case of future pandemics.

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